AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1   1. (Currently amended) A method for generating code to perform

2   anticipatory prefetching for data references, comprising:

3   receiving code to be executed on a computer system;

4   analyzing the code to identify data references to be prefetched;

5   calculating an execution time of a single loop iteration which includes the

6   identified data references, wherein the execution time includes an adjustment for

7   the execution probability of the identified data references;

8   calculating a prefetch ahead distance, wherein the prefetch ahead distance

9   includes the ratio of outstanding prefetches to the number of prefetch streams and

10   considers the probabilistically adjusted execution time of the single loop iteration,

11   and wherein the prefetch ahead distance indicates how many loop iterations ahead

12   to prefetch for; and

13   inserting prefetch instructions into a preceding basic block of the code in

14   advance of the identified data references based upon the prefetch ahead distance,

15   wherein inserting prefetch instructions involves inserting multiple prefetch

16   instructions for a given cache line, and wherein inserting the prefetch instructions

17   involves,

18   attempting to calculate a stride value for a given data

19   reference within a loop,

20   if the stride value cannot be calculated, setting the stride

21   value to a default stride value, and

22   inserting a prefetch instruction to prefetch the given data

23   reference for a subsequent loop iteration based on the stride value;

24   wherein the stride value is constant for some but not necessarily all loop

25   iterations.

1   2. (Original) The method of claim 1, further comprising allowing a system

2   user to specify the default stride value.

1   3. (Original) The method of claim 1, wherein calculating the stride value

2   involves:

3   identifying an induction variable for the stride value;

4   identifying a stride function for the stride value; and

5   calculating the stride value based upon the stride function and the

6   induction variable.

1   4. (Original) The method of claim 1, wherein inserting the prefetch

2   instruction based on the stride value involves:

3   calculating a prefetch cover distance by dividing a cache line size by the

4   stride value;

5   calculating a prefetch ahead distance as a function of a prefetch latency,

6   the prefetch cover distance and an execution time of a loop; and

7   calculating a prefetch address by multiplying the stride value by the

8   prefetch cover distance and the prefetch ahead distance and adding the result to an

9   address accessed by the given data reference.

1   5. (Original) The method of claim 1, wherein analyzing the code involves:

2   identifying loop bodies within the code; and

3   identifying data references to be prefetched from within the loop bodies.

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1   6. (Original) The method of claim 5, wherein analyzing the code to

2   identify data references to be prefetched involves examining a pattern of data

3   references over multiple loop iterations.

1   7. (Original) The method of claim 1, wherein analyzing the code involves

2   analyzing the code within a compiler.

1   8. (Currently amended) A computer-readable storage medium storing

2   instructions that when executed by a computer cause the computer to perform a

3   method for generating code to perform anticipatory prefetching for data

4   references, the method comprising:

5   receiving code to be executed on a computer system;

6   analyzing the code to identify data references to be prefetched;

7   calculating an execution time of a single loop iteration which includes the

8   identified data references, wherein the execution time includes an adjustment for

9   the execution probability of the identified data references;

10   calculating a prefetch ahead distance, wherein the prefetch ahead distance

11   includes the ratio of outstanding prefetches to the number of prefetch streams and

12   considers the probabilistically adjusted execution time of the single loop iteration,

13   and wherein the prefetch ahead distance indicates how many loop iterations ahead

14   to prefetch for; and

15   inserting prefetch instructions into a preceding basic block of the code in

16   advance of the identified data references based upon the prefetch ahead distance,

17   wherein inserting prefetch instructions involves inserting multiple prefetch

18   instructions for a given cache line, and wherein inserting the prefetch instructions

19   involves,

20   attempting to calculate a stride value for a given data

21   reference within a loop,

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22   if the stride value cannot be calculated, setting the stride

23   value to a default stride value, and

24   inserting a prefetch instruction to prefetch the given data

25   reference for a subsequent loop iteration based on the stride value;

26   wherein the stride value is constant for some but not necessarily all loop

27 iterations.

1   9. (Original) The computer-readable storage medium of claim 8, wherein

2 the method further comprises allowing a system user to specify the default stride

3 value.

1   10. (Original) The computer-readable storage medium of claim 8, wherein

2 calculating the stride value involves:

3   identifying an induction variable for the stride value;

4   identifying a stride function for the stride value; and

5   calculating the stride value based upon the stride function and the

6 induction variable.

1   11. (Original) The computer-readable storage medium of claim 8, wherein

2 inserting the prefetch instruction based on the stride value involves:

3   calculating a prefetch cover distance by dividing a cache line size by the

4 stride value;

5   calculating a prefetch ahead distance as a function of a prefetch latency,

6 the prefetch cover distance and an execution time of a loop; and

7   calculating a prefetch address by multiplying the stride value by the

8 prefetch cover distance and the prefetch ahead distance and adding the result to an

9 address accessed by the given data reference.

1   12. (Original) The computer-readable storage medium of claim 8, wherein

2   analyzing the code involves analyzing the code within a compiler.

1   13. (Currently amended) An apparatus that generates code to perform

2   anticipatory prefetching for data references, comprising:

3   a receiving mechanism that is configured to receive code to be executed on

4   a computer system;

5   an analysis mechanism that is configured to analyze the code to identify

6   data references to be prefetched;

7   a calculating mechanism that is configured to calculate an execution time

8   of a single loop iteration which includes the identified data references, wherein the

9   execution time includes an adjustment for the execution probability of the

10   identified data references;

11   a calculating mechanism that is configured to calculate a prefetch ahead

12   distance, wherein the prefetch ahead distance includes the ratio of outstanding

13   prefetches to the number of prefetch streams and considering the probabilistically

14   adjusted execution time of the single loop iteration, and wherein the prefetch

15   ahead distance indicates how many loop iterations ahead to prefetch for; and

16   an insertion mechanism that is configured to insert prefetch instructions

17   into a preceding basic block of the code in advance of the identified data

18   references based upon the prefetch ahead distance, wherein the insertion

19   mechanism facilitates inserting multiple prefetch instructions for a given cache

20   line;

21   wherein the insertion mechanism is configured to,

22   attempt to calculate a stride value for a given data reference

23   within a loop,

24   set the stride value to a default stride value if the stride

25   value cannot be calculated, and to

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26   insert a prefetch instruction to prefetch the given data

27   reference for a subsequent loop iteration based on the stride value;

28   wherein the stride value is constant for some but not necessarily all loop

29   iterations.

1   14. (Original) The apparatus of claim 13, further comprising a

2   configuration mechanism that is configured to receive the default stride value

3   from a system user.

1   15. (Original) The apparatus of claim 13, wherein while calculating the

2   stride value, the insertion mechanism is configured to:

3   identify an induction variable for the stride value;

4   identify a stride function for the stride value; and to

5   calculate the stride value based upon the stride function and the induction

6   variable.

1   16. (Original) The apparatus of claim 13, wherein the insertion mechanism

2   is configured to:

3   calculate a prefetch cover distance by dividing a cache line size by the

4   stride value;

5   calculate a prefetch ahead distance as a function of a prefetch latency, the

6   prefetch cover distance and an execution time of a loop; and to

7   calculate a prefetch address by multiplying the stride value by the prefetch

8   cover distance and the prefetch ahead distance and adding the result to an address

9   accessed by the given data reference.

1   17. (Original) The apparatus of claim 13, wherein the apparatus resides

2   within a compiler.

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1   18-45 (Canceled).